

NATURE OF THE INTROMITTENT ORGAN OF THE ODONATA

In the great family of insects called Odonata, the males have a peculiar accessory sexual organ known as the intromittent organ.

This is situated on the rear segment of the thorax on the ventral side, and is used as an accessory organ during copulation. Before copulation the males, which emerge from the water before the females, fill the organ with seminal fluid from their own sexual organs. They are now ready for a mate and sally forth over some likely pond or stream watching for a female pupa which is just emerging from the water.

The female when ready to emerge casts her pupal skin and crawls up some convenient plant stem until she emerges from the water. The male seeing her thus grasps her by the neck with his anal forceps and carries her to some suitable place where she may dry herself ready for flight. When ready for flight they mate in the air. Again his anal forceps are brought into play; he grasps her by the neck and supports their combined weight in the flight. She now places the tip of her abdomen in contact with his thoracic claspers, while with the intromittent organ the sperms are transmitted.

It is quite an interesting problem how this intromittent organ arose in the phylogeny of the insect, and what organs and functions were modified in producing the effect.

Originally the sexual organs of the male, at least the external accessory organs, must have been anal in situation as in most of the insect families.

Evidently in this case the forceps and this functional development for carrying the female by the neck rendered it more difficult for the female to get her body around into proper position for receiving the male elements. Perhaps the extreme elongation of the abdomen in both sexes also entered into the modification.

So, simultaneously with the development of the forceps and the elongated abdomen, must have developed the habit of the male of first emitting his semen on the appendages of the thorax.

Now right here lies the peculiar discovery noted in this paper; the intromittent organ is jointed in the manner of insect legs, and the writer raises the question as to whether it is homologous with a pair of legs. This organ consists of four well defined joints, which may

be seen in the photo and are numbered a, b, c, d. In case this is a true leg structure the segments would be (a) coxa, (b) femur, (c) tibia, (d) tarsus. See plate XXVI, Fig. 2 and text figure 1.

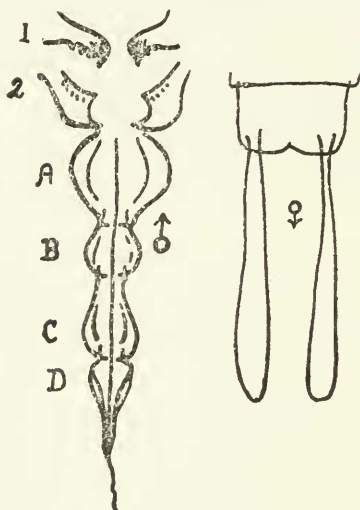


Fig. 1. Diagram of male (left) and female (right) accessory abdominal appendages for copulation. (See also Plate XXVI, Fig. 2).

The question immediately arises, did not the Odonata once have a thorax of four segments, and does not this leg structure represent a rudimentary fourth segment?

There is a good opportunity here for investigation of larval and nymph forms of the different species to look for evidence for or against this theory of the origin of the organ.

This leg structure is paired, forming a single median organ, the inner opposed surfaces of which are hollowed out forming a cavity in which the seminal elements are retained. The terminal segments or tarsi are prolonged into a minute tapering tube. The two preceding segments of the thorax have a pair of clasp ing organs by which certain appendages of the female abdomen are grasped to enable her to retain her difficult position during copulation. See the diagram of the ventral aspect of the male thorax where the claspers are designated 1 and 2, and the female accessory abdominal appendages which slip under the male claspers (text Fig. 1).

These two claspers on the male thorax do not show any evidence of joints and are evidently simple modifications of the hypoderm of the segments on which they are located.

These claspers present certain arrangements of external sense organs which vary in the different species.

It may be that some of the readers of the Transactions will have a different theory of the origin of this structure and its nature; if so, we should much like to hear from them and get other facts bearing on the embryology of the organ.

Battle Creek, Mich.

E. W. ROBERTS.

SUGGESTIONS FOR AMATEUR MICROSCOPISTS

1. *Whole Mounts*—Many interesting and beautiful specimens may be made from small insects, by steeping in concentrated carbolic acid solution, and mounting entire without compression. This agent is used especially to render transparent such subjects as acari and lice, parasites of birds, as it clears the outer skin and renders the internal organs visible. Crystallized carbolic acid liquified by heat, with the addition of 1 drachm of glycerine to 4 ounces of the melted carbolic acid, will not become solid again.

The acaridae or mites give interesting studies in color, form, and variety. For literature, see *Science Gossip*, or the monograph on the Oribatidae in the Ray Society by A. D. Michael.

2. *Internal Organs of Cockroach*—The members of the cockroach family can easily be obtained, and furnish interesting material. To kill, put a few drops of chloroform on blotting paper and cover together with animal. It is well to select some special and definite line of study,—as, say, the abdominal viscera,—after having studied the external parts.

To study the viscera of course requires dissection. The following suggestions will aid the beginner:

Remove all external appendages, as wings and legs, with scissors. To make a dissecting dish, take a piece of gutta percha, such as is supplied for boot soles, cut a piece $4\frac{1}{2} \times 2\frac{1}{2}$ inches, soften in hot water, bend the edges so as to form a dish or pan. Drop into this a mixture of paraffin, white or blackened by lampblack, as preferred. Before this is entirely set the back of the insect may be